Abstracts

Sanjay Ramassamy (ENS de Lyon)

Title: Miquel dynamics for circle patterns

Abstract: Circle patterns are one of the ways to uniformize graphs on surfaces, by embedding them in such a way that every face admits a circumcircle. In this talk I will describe a discrete-time dynamical system on circle patterns with the combinatorics of the square grid. This dynamics, based on the classical six-circles theorem of Miquel, is called Miquel dynamics. It was introduced by Richard Kenyon as an attempt to find a connection between circle patterns and a model from statistical mechanics called the dimer model. I will present some properties of this dynamics which suggest its integrability. Partly joint work with Alexey Glutsyuk (ENS de Lyon/Higher School of Economics)

Denis Serre (ENS de Lyon)

Title: Divergence-free positive tensors ; applications to gas dynamics.

Abstract: For positive tensors T that satisfy $\operatorname{Div} T = 0$, the determinant enjoys a curious integrability property. One may relax the constraint by asking that $\operatorname{Div} T$ be a bounded measure. These results contain, as a particular case, the isoperimetric inequality. An important application concerns gas dynamics, where the conservation of mass and momentum can be written as $\operatorname{Div} T = 0$. We obtain a new fundamental estimate, in terms of a space-time integral. This can be done either for dense gases (Euler equations) or rarefied gases (Boltzmann equation).

Takahito Kashiwabara (The University of Tokyo)

Title: Semigroup approach and maximal-regularity theory for the primitive equations

Abstract: Analytic semigroup and maximal regularity are powerful tools to study nonlinear parabolic equations. In this talk, we apply these theories to study the primitive equations, which describe large-scale motion of ocean or atmosphere and are obtained by assuming the hydrostatic balance in the vertical direction of the 3D Navier-Stokes equations. We establish existence and uniqueness of a global-in-time strong solution to the primitive equations within the L^p-framework, either by analytic semigroup approach or by maximal regularity. We will also discuss our recent results corresponding to the end-point case $p = \infty$, whose proof essentially requires both of the two theories mentioned above.

Shigeki Aida (The University of Tokyo)

Title: Asymptotics of spectral gaps on infinite dimensional spaces

Abstract: Let E be a smooth function on $\mathbb{R}^N$ and consider the normalized probability measure $\mu_\lambda(dx) = Z_\lambda^{-1} e^{-\lambda E} dx$ on $\mathbb{R}^N$ and a Dirichlet form $\mathcal{E}_\lambda(f, f) = \int_{\mathbb{R}^N} |Df(x)|^2 d\mu_\lambda(x)$ on $L^2(\mathbb{R}^N, \mu_\lambda)$. The asymptotic behavior of the spectral gap of the generator of $\mathcal{E}_\lambda$ as $\lambda \to \infty$ and related asymptotic problems of the spectrum of Schrödinger operators $-\Delta + \lambda^2 U$ on $L^2(\mathbb{R}^N, dx)$ have been studied by many researchers and many important results are obtained. In this talk, we discuss infinite dimensional version of this problem *e.g.* in the cases of loop spaces and spatially cut-off $P(\phi)_2$-Hamiltonians.

Marco Mazzucchelli (ENS de Lyon)

Title: Periodic orbits of Tonelli Hamiltonian systems on surfaces

Abstract: This talk is about the existence of periodic obits of classical Hamiltonian systems, often called Tonelli or optical Hamiltonian systems, in the cotangent bundle of closed surfaces. This setting encompasses several celebrated dynamical systems, such as the Riemannian and Finsler geodesic flows, and the so called magnetic geodesic flows. After recalling the background, I will summarize some open conjectures in the field, and present a few recent results, including the existence of remarkable action minimizing periodic orbits and of infinitely many periodic orbits on almost all low energy levels.

Hideko Sekiguchi (The University of Tokyo)

Title: Representations of semisimple Lie groups and Penrose transform

Abstract: The classical Penrose transform is generalized to an intertwining operator on Dolbeault cohomologies of complex homogeneous spaces X of (real) semisimple Lie groups. I plan to discuss a detailed analysis when X is an indefinite Grassmann manifold. To be more precise, we determine the image of the Penrose transform, from the Dolbeault cohomology group on the indefinite Grassmann manifold consisting of maximally positive k-planes in $\mathbb{C}^{p,q}$ $(1 \leq k \leq \min(p,q))$ to the space of holomorphic functions over the bounded symmetric domain. Furthermore, we prove that there is a duality between Dolbeault cohomology groups in two indefinite Grassmann manifolds, namely, that of positive k-planes and that of negative k-planes.

Valentin Seigneur (ENS de Lyon)

Title: Extending Morse functions from a neighborhood of the sphere to the ball

Abstract: Consider a smooth function defined in a neighborhood of the unit sphere in some euclidean space. Assume this function has no critical point and that its restriction to the sphere is Morse. Can one extend it to a function defined in the unit ball without critical points? We will discuss this question when the dimension of the sphere is at least 6.

Oleksii Leontiev (The University of Tokyo)

Title: Symmetry breaking operators for the restriction of representations of indefinite orthogonal groups $O(p,q)$

Abstract: For the pair $(G,G') = (O(p+1,q+1), O(p,q+1))$, we construct and give a complete classification of intertwining operators (symmetry breaking operators) between most degenerate spherical principal series representations of G and those of the subgroup G', extending the work initiated by Kobayashi and Speh [Mem. Amer. Math. Soc. 2015] in the real rank one case where $q = 0$. Functional identities and residue formulae of the regular symmetry breaking operators are also provided explicitly. This is a joint work with T. Kobayashi.

Takeshi Tsuji (The University of Tokyo)

Title: Recent progress in integral p-adic Hodge theory

Abstract: A few years ago, Bhatt, Morrow, and Scholze introduced a new cohomology theory, which gives us a way to compare integral p-adic cohomologies (p-adic etale, crystalline, and de Rham) of degree higher than p for varieties with good reduction over a p-adic field. After briefly reviewing results in p-adic Hodge theory known before their work, I will survey the new theory and some developments afterward (on p-adic vanishing cycles, semi-stable reduction case, cohomologies with coefficientsc).

Laurent Berger (ENS de Lyon)

Title: The Nottingham group

Abstract: Abstract: The Nottingham group is a group of power series with coefficients in a finite field, the group operation being composition of power series. It is an object of interest to number theorists and (more recently) group theorists. I will discuss some features of this group, and of the arithmetic of these power series.